

# PATENT ABSTRACTS OF JAPAN

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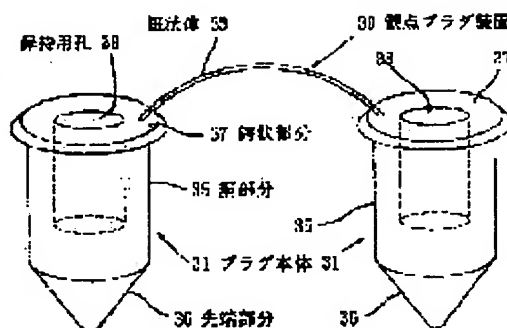
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## (54) LACRIMAL PUNCTUM PLUG DEVICE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To ensure a closing effect when a lacrimal punctum plug device is worn at the lacrimal punctum, to surely prevent the device from sinking into the lacrimal duct, and to enable the device to be removed very easily.

**SOLUTION:** A lacrimal punctum plug device comprises: a plug main body 31, which has a shell portion 35 having a cylindrical outer peripheral surface, an end portion 36 provided in such a way as to continue with one end of the shell portion 35 and getting smaller in diameter toward an end, and a flanged portion 37 provided at the other end of the shell portion 35; and a cord 33 one end of which is connected to the flanged portion 37 of the plug main body 31. A large-diameter stopper or another plug main body 31 can be provided at the end of the cord 33. A through hole extending axially through the flanged portion 37, the shell portion 35, and the end portion 36 and having its minimum diameter size specified can be formed through the plug main body 31.





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**CLAIMS**

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[Claim(s)]

[Claim 1]A punctum-lacrimale plug apparatus comprising:

a collar provided in the other end of a tip end part which was provided succeeding a barrel part which has a cylindrical peripheral face, and one end of this barrel part, which goes at a tip, and which is alike, follows and serves as a byway, and said barrel part -- a plug body which has the \*\* portion and which was formed of a biocompatible material.

A string-like object in which that end was connected with a part for a collar-like part of this plug body.

[Claim 2]The punctum-lacrimale plug apparatus according to claim 1, wherein a tip end part of a plug body is conical shape and the apex part is sphere form.

[Claim 3]The punctum-lacrimale plug apparatus according to claim 1 or 2, wherein a byway portion of a byway is formed from a barrel part between a part for a collar-like part and a barrel part of a plug body.

[Claim 4]The punctum-lacrimale plug apparatus according to any one of claims 1 to 3, wherein a stopper of a major diameter is formed at a tip of a string-like object from the string-like object concerned.

[Claim 5]The punctum-lacrimale plug apparatus according to any one of claims 1 to 4 characterized by forming a breakthrough as which a size of a minimum

diameter was specified so that a part for a collar-like part, a barrel part, and a tip end part may be penetrated to shaft orientations of the barrel part concerned and it may be extended in a plug body.

[Claim 6]A punctum-lacrimale plug apparatus comprising:

Two of plug bodies indicated to either claim 1 - claim 5.

A string-like object in which those both ends were connected with a part for each collar-like part of these two plug bodies.

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[Translation done.]

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the punctum-lacrimale plug apparatus which insertion and mounting is carried out to the punctum lacrimale of an eye, and is used for the therapy of diseases, such as lacrimal duct obstruction and \*\*\*\*\*, etc.

[0002]

[Description of the Prior Art]As shown in drawing 8, a lacrimal duct, In the medial angle of eye of the eye 10. It is formed of the lacrimal sac 16 and the nasolacrimal duct 17 from this total lacrimal canaliculus 15 to the upper lacrimal canaliculus 13 which passes to the upper punctum lacrimale 11 which carries out an opening to an up-and-down position and the lower punctum lacrimale 12, and these punctum lacrimale, respectively and the lower lacrimal canaliculus 14, the total lacrimal canaliculus 15 to which these lacrimal canaliculi become together, and a nasal cavity. 18 is lachrymal gland which secretes tear fluid. And if a blockade or strangulation arises in one part of the lacrimal ducts, in order that tear fluid may not flow out smoothly, it becomes the epiphora (what is called \*\*\*\*), If the outflow of tear fluid becomes superfluous by unusual extension of the case of lacrimation \*\*\*\*\* which lachrymal gland depends unusually, the punctum lacrimale, etc., the initial complement of tear fluid will serve as \*\*\*\*\* (what is

called dry eye) which does not stagnate in an eye. A punctum-lacrimale plug is used mainly for the therapy of these diseases.

[0003]The mounting state of a punctum-lacrimale plug known conventionally is typically shown in drawing 9. This punctum-lacrimale plug 20 is constituted by the amount of [ the center rod portion 21, the tip plug portion 22 of the conical trapezoid provided at the tip of this center rod portion 21, and / that were provided in the other end of the center rod portion 21 / 23 ] inclination collar-like part. The state where the tip plug portion 22 and the center rod portion 21 following this were inserted into the lacrimal canaliculus 26 from the punctum lacrimale 25 is equipped with this punctum-lacrimale plug 20. That is, where the punctum lacrimale is equipped, after being orthopedically operated automatically by the considerable state where period detention was carried out and the punctum lacrimale or a lacrimal canaliculus was fully expanded, extraction is carried out to the therapy of the punctum-lacrimale obstruction or the lacrimal-canaliculus obstruction. Since the punctum lacrimale is blockaded by wearing of a punctum-lacrimale plug and the outflow of tear fluid is prevented, the pain by lacrimation \*\*\*\*\* or \*\*\*\*\* is eased. It is located by the amount of [ 23 ] inclination collar-like part on the external edge part of the punctum lacrimale at the time of wearing, and it has the operation as a stopper to surrender devotion.

[0004]

[Problem(s) to be Solved by the Invention]However, since the shape of the tip plug portion 22 where the blockade operation should be demonstrated is a conical trapezoid, the above-mentioned punctum-lacrimale plug 20 cannot necessarily obtain a good blockade operation, and may give an excessive stimulus. Since the portion from which the above-mentioned punctum-lacrimale plug 20 serves as a key does not exist, Although the work which carries out extraction of the punctum-lacrimale PURAGU \*\* with which it was once equipped is fairly difficult and the amount of [ 23 ] inclination collar-like part moreover exists, The time of the wearing, or during the detention, the whole punctum-lacrimale plug 20 concerned may carry out surrender devotion into a lacrimal canaliculus, and there is a problem that the extraction becomes very difficult in that case.

[0005] This invention is made based on the above situations, the punctum lacrimale is equipped, a positive embolus effect is acquired, and carrying out surrender devotion into a lacrimal canaliculus is prevented certainly, and the purpose of this invention has it in providing the punctum-lacrimale plug apparatus which can moreover perform the extraction very easily.

[0006]

[Means for Solving the Problem] This invention is characterized by a punctum-lacrimale plug apparatus comprising the following.

a collar provided in the other end of a tip end part which was provided succeeding a barrel part which has a cylindrical peripheral face, and one end of this barrel part, which goes at a tip, and which is alike, follows and serves as a byway, and said barrel part -- a plug body which has the \*\* portion and which was formed of a biocompatible material.

A string-like object in which that end was connected with a part for a collar-like part of this plug body.

[0007] Above, a tip end part of a plug body is conical shape, and, as for the apex part, it is preferred that it is sphere form. It is preferred that a byway portion of a byway is formed from a barrel part between a part for a collar-like part and a barrel part of a plug body. In a punctum-lacrimale plug apparatus of this invention, it is preferred that a stopper of a major diameter is formed at a tip of a string-like object from the string-like object concerned.

[0008] A breakthrough as which a size of a minimum diameter was specified can be formed in a plug body of this invention so that a part for a collar-like part, a barrel part, and a tip end part may be penetrated to shaft orientations of the barrel part concerned and it may be extended. This invention is characterized by a punctum-lacrimale plug apparatus comprising the following.

Two of the above plug bodies.

A string-like object in which those both ends were connected with a part for each collar-like part of these two plug bodies.

[0009]

[Embodiment of the Invention] Hereafter, the punctum-lacrimale plug apparatus of this invention is explained concretely. Drawing 1 is a perspective view for explanation showing the composition of the punctum-lacrimale plug apparatus 30 concerning the desirable example of this invention. This punctum-lacrimale plug apparatus 30 is constituted by the two plug bodies 31 and 31 and the one string-like object 33 which connects these two plug bodies 31 and 31 of each other. In this punctum-lacrimale plug apparatus 30, have the two plug bodies 31 of each other, and the same composition that each, the collar provided succeeding the barrel part [ which has a cylindrical peripheral face located in the center as shown in drawing 2 ] 35, and tip end part 36 side of the conical shape established succeeding the one end side (under a figure) of this barrel part 35, and the other end side (on a figure) of the barrel part 35 -- the \*\* portion 37 is considered as the composition formed in one.

[0010] The amount of [ 37 ] collar-like part is a disc-like portion of the major diameter which projects in the method of the outside of a radial direction from the periphery edge of the barrel part 35, and the peripheral face 37A is made into the tapered shape which goes to the outer edge surface side (upper part) and which is alike, therefore serves as a byway. In this example, the hole 38 for maintenance of the owner bottom which carries out an opening to the outer edge surface for the collar-like part 37 (upper surface), and is extended to shaft orientations ranging from a part for the collar-like part 37 concerned to the barrel part 35 is formed. And the both ends of the string-like object 33 are connected with a part for each collar-like part 37 of the two plug bodies 31 in the proper part of the outer edge surface at one, respectively. The tip end part 36 is conical shape which has a base which has an outer diameter equivalent to the barrel part 35, and the apex part 36A is made into sphere form.

[0011] As construction material of the plug body 31 in the above punctum-lacrimale plug apparatus 30, and the string-like object 33, especially if it is a flexible material which suits a living body, it is not limited, but silicone rubber can be used preferably, for example.

[0012] in the above plug body 31 -- the whole -- axial length -- L -- for example, -- it is 2.0-5.0 mm preferably 1.5-10.0 mm -- among these, a collar -- the thickness



of the \*\* portion 37 is 0.1-0.5 mm. the length H1 of the barrel part 35 is 1.0-8.0 mm, and the outer diameter D is 1.0-1.3 mm preferably 0.8-1.5 mm -- a collar -- the outer diameter of the \*\* portion 37 is 1.3-1.7 mm preferably 1.2-2.0 mm. The path of the hole 38 for maintenance is made into a size, for example, the size of 0.2-0.6 mm, suitable for the specillum (Bougie) for holding the plug body 31 concerned and inserting in the punctum lacrimale.

[0013]The string-like object 33 will not be that to which especially the shape is limited, if the two plug bodies 31 are connected, Cylindrical shape, cylindrical shape, a ribbon base, etc. may be proper, when cylindrical or cylindrical, the outer diameter shall be about 0.1-1.0 mm, and length shall be about 1.5-5.0 mm preferably 1.0-10.0 mm, for example.

[0014]Although the above punctum-lacrimale plug apparatus 30 of this invention of composition can manufacture the whole in one and directly by the molding means of silicone rubber, Each plug body 31 can be manufactured independently and it can manufacture also by the method of connecting the two with a proper string-like object material. In this case, it can also be considered as the construction material which differs in the plug body 31 and the string-like object 33.

[0015]The above-mentioned punctum-lacrimale plug apparatus 30 has the above composition, Bougie of an inserter (insertion appliance implement) is inserted into the hole 38 for maintenance of one plug body 31, and the plug body 31 concerned is held, The state where made the tip end part 36 into the head, it was inserted for example, in an application patient's upper punctum lacrimale, and the tip end part 36 and the barrel part 35 were located in the upper lacrimal canaliculus, and it was located by the amount of [ 37 ] collar-like part on the periphery of external of the upper punctum lacrimale is equipped. The lower punctum lacrimale is completely similarly equipped with the plug body 31 of another side. and -- the state where both the punctum lacrimale of one eye was equipped with the punctum-lacrimale plug being acquired by this, and accepting necessity -- a proper period -- it is detained as it is.

[0016]In the punctum-lacrimale plug apparatus 30 of such composition, since the tip end part 36 is conical shape, insertion is easy, and since the apex part 36A is

moreover sphere form, there is no possibility of wounding the organization around the punctum lacrimale and a lacrimal canaliculus. The target embolus effect can be demonstrated certainly, without the barrel part 35 concerned giving the organization of a lacrimal canaliculus an excessive stimulus in the state where it was located in the lacrimal canaliculus, since the barrel part 35 which has a cylindrical peripheral face in each plug body 31 is formed.

[0017]The string-like object 33 is formed so that it may be extended from a part for the collar-like part 37 in each plug body 31, and this string-like object 33 is located in the exterior of the punctum lacrimale also in the state where it was equipped with the plug body 31. Therefore, extraction of the plug body 31 with which it was equipped very easily can be carried out for this string-like object 33 by holding and pulling out with tweezers etc. And even if it is a case where the plug body 31 with which it was equipped carries out surrender devotion into a lacrimal canaliculus temporarily, this string-like object 33, Since other plug bodies 31 are connected with the other end, the whole device is prevented from it serving as a stopper and being absorbed in the punctum lacrimale concerned, therefore at least some of punctum-lacrimale plug apparatus 30 concerned certainly exist in the exterior of the punctum lacrimale concerned, Extraction of the plug body 31 which carried out surrender devotion can be certainly pulled out and carried out from a lacrimal canaliculus or the punctum lacrimale using the portion which exists in this exterior.

[0018]Above, above the hole 38 for maintenance of each plug body 31 is not indispensable, and it can equip with it by holding and operating the string-like object 33 with tweezers etc. at the target punctum lacrimale.

[0019]In the punctum-lacrimale plug apparatus 30 of the above-mentioned composition, Since the two plug bodies 31 are connected with the string-like object 33 of proper length, it is convenient to be able to equip the upper punctum lacrimale and the lower punctum lacrimale with these two plug bodies 31, respectively, and to carry out the plug of both punctum lacrimale, and, moreover, operation of wearing becomes very simple. In such direction for use, it shall be preferred that the length of the string-like object 33 conforms to the distance of both punctum lacrimale, and it shall usually be about 1.5-5.0 mm.

[0020]According to the punctum-lacrimale plug apparatus 30 of the above-mentioned composition, if the string-like object 33 is cut in a proper part, the punctum-lacrimale plug apparatus in the state of coming to connect the end of a string-like object (fragment portion) with a part for the collar-like part 37 of the one plug body 31 will be obtained. In the example of drawing 6 mentioned later, this is equivalent to the state where the stopper 61 is not formed. Although this punctum-lacrimale plug apparatus serves as a free end finished with the state where the tip of that string-like object is as it is, the plug body 31 concerned can be used like the above, being able to equip the punctum lacrimale, and can use a string-like object for that wearing and operation of extraction. Although the length in particular of the string-like object 33 in such a case is not restricted, it is preferred that it is at least 1.0 mm or more. Either the upper punctum lacrimale or the lower punctum lacrimale has [ such direction for use ] the punctum lacrimale convenient a case with which it should equip. And since the string-like object (fragment portion) remains also in the remaining plug bodies 31, this can completely be used effectively similarly.

[0021]Drawing 3 is a front view showing the modification of the plug body in this invention, and the string-like object is omitted. In the plug body 40 of this example, the byway portion 41 whose outer diameter is smaller than the barrel part 35 is formed between parts for the barrel part 35 and the collar-like part 37. The height H2 of this byway portion 41 is 0.5-4.0 mm, and an outer diameter is 0.5-1.2 mm. It is prevented from the plug body 31 with which it was equipped falling out from the punctum lacrimale carelessly, and coming out of it by forming such a byway portion 41 following a part for the collar-like part 37.

[0022]Drawing 4 is a front view showing other modifications of the plug body in this invention, and the string-like object is omitted. In the plug body 50 of this example, like the example of drawing 3, although the byway portion 41 is formed following a part for the collar-like part 37, the taper slant surface part 51 is formed between this byway portion 41 and barrel part 35. According to such composition, it becomes easy to carry out extraction of the plug body 31 concerned with which it was equipped by the taper slant surface part 51 concerned, and it can prevent giving the surrounding organization an excessive

stimulus moreover in that case.

[0023]Drawing 5 is a front view showing the modification of further others of the plug body in this invention, and the string-like object is omitted. In the plug body 55 of this example, like the example of drawing 4, the byway portion 41 and the taper slant surface part 51 are formed following a part for the collar-like part 37, and. A tip end part is constituted by a part for the nose circle cone-like part 56, and the byway cylindrical portion 57 following this, and this byway cylindrical portion 57 is considered as the composition which follows the barrel part 35 via the taper slant surface part 58. According to such composition, when the tip end part is constituted by a part for the nose circle cone-like part 56, and the byway cylindrical portion 57, insertion into the punctum lacrimale becomes easy and it can prevent giving the surrounding organization an excessive stimulus moreover in that case.

[0024]Drawing 6 is a perspective view for explanation of the punctum-lacrimale plug apparatus 60 concerning other examples of this invention, and this punctum-lacrimale plug apparatus 60 comprises the following:

The one plug body 31.

The string-like object 33 in which that end was connected with a part for the collar-like part 37 of this plug body 31.

The stopper 61 which has a larger outer diameter than the outer diameter of the string-like object 33 concerned provided at the tip of this string-like object 33.

Also in the punctum-lacrimale plug apparatus 60 of this composition, the same operation effect as an example as stated above is obtained. That is, since the string-like object 33 and the stopper 61 are formed in the plug body 31, extraction of the plug body 31 concerned with which it was equipped can be easily performed via these, and the whole is certainly prevented from carrying out surrender devotion into a lacrimal canaliculus.

[0025]In the punctum-lacrimale plug apparatus 60 of the above composition, the shape in particular of the stopper 61 is not limited and can be made into the thing of proper shape, such as a globular shape, disc-like, and ring shape. The maximum outer diameter of this stopper 61 needs to be larger than the outer diameter of the string-like object 33, for example, it shall be preferred to be

considered as 1.5 or more times of the outer diameter of the string-like object 33, and it shall specifically be about 0.3-2.0 mm.

[0026]Drawing 7 is a sectional view for explanation of the punctum-lacrimale plug apparatus 70 concerning the example of further others of this invention, and, as for the string-like object 33, only the part is shown. It is open for free passage to the hole 38 for maintenance, and the breakthrough 71 extended even in the apex part of the tip end part 36 is formed in the plug body 31 of this punctum-lacrimale plug apparatus 70. The inside diameter R of this breakthrough 71 is smaller than the inside diameter of the hole 38 for maintenance, for example, it is within the limits of about 0.1-0.3 mm, and, moreover, let that minimum inside diameter (in the example of a figure, it is in agreement with the inside diameter of the breakthrough 71.) be the specified size. Since according to the punctum-lacrimale plug apparatus 70 of such composition the channel of the tear fluid which results in the apex part of the tip end part 36 located in a lacrimal canaliculus is secured from a part for the collar-like part 37 located in the exterior of the punctum lacrimale in the state where it was equipped and the minimum diameter is moreover specified, The flow into the lacrimal canaliculus of tear fluid is controllable. Therefore, it becomes possible to pour the tear fluid of an initial complement to a lacrimal duct via a lacrimal canaliculus moreover, acquiring the embolus effect fundamentally demonstrated by a barrel part.

[0027]As mentioned above, although some examples of this invention were described, it is possible to add various change in this invention. For example, as a plug body, the thing of the composition of a gap to illustrate or its thing which changed can be used. Therefore, in the composition with which two plug bodies were connected with the string-like object, the composition in particular of plug body itself is not limited, and composition may differ between one plug body and the plug body of another side mutually. the end of a string-like object -- the collar of a plug body -- as long as it is an outer edge surface part of the \*\* portion, it may connect with which part -- a collar -- it may be a part on the peripheral face of the \*\* portion. A part for the collar-like part of a plug body can also be changed into the state where it inclined to the shaft orientations of a barrel part.

[0028]

[Effect of the Invention]According to the punctum-lacrimale plug apparatus of claim 1 of this invention, the punctum lacrimale is equipped, a positive embolus effect is acquired, and carrying out surrender devotion into a lacrimal canaliculus is prevented certainly, and, moreover, it can perform the extraction very easily. According to the invention concerning claim 2, the tip end part of a plug body is conical shape, and the apex part can perform easily insertion and wearing to the punctum lacrimale by being sphere form.

[0029]According to the invention concerning claim 3, the plug body with which it was equipped by forming the byway portion of the byway escaping from a barrel part, and coming out between a part for a collar-like part and the barrel part of a plug body, is prevented. According to the invention concerning claim 4, also when the plug body concerned carries out surrender devotion by forming the stopper of the major diameter at the tip of a string-like object from the string-like object concerned, the whole is prevented from being absorbed and it can perform the cash drawer easily certainly.

[0030]According to the invention concerning claim 5, to penetrate a part for a collar-like part, a barrel part, and a tip end part to the shaft orientations of the barrel part concerned, and to be extended to a plug body, by forming the breakthrough as which the size of the minimum diameter was specified, the channel of the tear fluid to a lacrimal canaliculus is secured, and, moreover, the flow can be controlled. According to the punctum-lacrimale plug apparatus of this invention concerning claim 6, have two of plug bodies, and the string-like object in which those both ends were connected with a part for each collar-like part of these two plug bodies, and since, The plug of both the upper punctum lacrimale and the lower punctum lacrimale can be carried out, moreover the extraction is very easy, and since it can dissociate by cutting a string-like object and can also be used separately, it is dramatically convenient.

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[Translation done.]